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Vibratory Stimulation

Its Physiologic Basis and Therapeutic Possibilities

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VIBRATORY STIMULATION: ITS PHYSIOLOGIC BASIS AND THERAPEUTIC POSSIBILITIES.

By Samuel S. Wallian, A.M., M.D.
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In an ultimate and strictly logical sense all therapeutic means are natural, since outside of Nature there is nothing. But the expression "Natural Therapeutics," by common consent has come to mean those measures that involve the forces, influences and materials of Nature, as it were, at first hand, as opposed to the technically artificial resources of the chemist and pharmacist.

The trend of therapeutic investigation and experiment, for the past half century, has been decidedly in the direction of natural therapeutics, and the past decade has been

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productive of more progress in practical results in this field than any similar period in the world's history.

The medical historian of the year 2000, sitting down to write a retrospective review of the current century, will no doubt call attention to this as the initial period of phenomenal activity in the matter of analyzing, adapting and utilizing physiologic measures and mechanical forces, for medical and surgical purposes.

A generation ago the publication of "A System of Physiologic Therapeutics," comprised in a series of eleven sumptuously printed volumes, edited by one of the foremost practitioners and clinicians of the age, and prepared by men of professional preeminence on both sides of the Atlantic, would have been considered *prima facie* evidence of a crack-brained editor and a foolhardy publisher. It would have added one more bulky item to the many examples of dead stock on the medical bookseller's shelves. To-day this work is a successful accomplishment.

And yet all these advances are strictly in line with other scientific and evolutionary changes, developments and readjustments of thought and theory regarding the origin of

force and matter and of their countless combinations and reactions. All the older theories have been challenged, and many of them set aside as incompetent and unsatisfactory. One of the most radical and important of these rehabilitations pertains to the nature of matter itself. By way of example atoms have ceased to be considered ultimates, and no scientist now attempts to dissociate matter and motion, substance and condition. The *ion,* standing for the time being as a hypothetical unit of force or motion, has supplanted the time-honored role of the practically discarded molecule; and matter, it is now held, becomes a visible and palpable manifestation or entity only when combining or combating motions or forces of some kind are brought in contact.

If we admit this latest postulate of science, matter is merely a modality of motion, a variety of vibration whose rate and rhythm are both invisible and incomputable. As a legitimate corollary any given material substance, its nature, form, character and proportions, depends entirely on the rate, rhythm and tension of the vibration by which it makes itself manifest.

As a second inevitable corollary life itself is a resultant of vibration, and disease must

be classed as either vibratory inertia or vibratory discord.

Pursuing this thought, nothing could be more natural or rational than to invoke artificial or mechanical vibration as a corrective and stimulant of disordered vital vibration.

The first practical demonstration of the availability of mechanical vibration as a therapeutic expedient was made in Germany, where it aroused considerable interest and met with the usual opposition. Medical men are traditionally and instinctively averse to the hasty recognition of non-medicinal therapeutic measures, and as yet but few of the rank and file of the profession have given more than a casual glance at the subject of vibratory therapeutics. It must be added that most of those who have thus cursorily investigated the claims of its sometimes over-enthusiastic advocates have been inclined to put it aside as merely a species of mechanical massage, well enough for the use of barbers and masseurs, and to be rated about on a par with mechanical piano playing. It is not the first instance in which medical men have been guilty of superficial investigation—with its usual result of inexcusable misconception.

While properly adapted mechanical vibra-

tion can be made to supplement, greatly excel, and therefore supersede the manipulations of the manual masseur, its adaptation to therapeutic use, when fully and scientifically developed, is based on principles of which the most expert masseur has never dreamed, and is capable of results which to him would savor of the miraculous.

The basis and physiologic rationale of these results will bear a careful study.

For some years past there has been much rather vague but quite generally accepted teaching and speculation as to the nature of the important if not wholly controlling influence of what have been termed by histologists *trophic centers.* To these centers have been ascribed various vital dominations, especially the control of body temperature. Progress has also been made in the construction of a system of localization of the vis a tergo of all the vital functions, including nutrition, elimination and all forms of tissue metabolism. Corresponding with this it is quite in vogue to ascribe the various psychic manifestations and disturbances to more or less accurately located cerebral centers.

It is but a step to this newer claim that all the organs of the body, including every viscus, the blood vessels, lymphatics, the ab-

sorbing and eliminating surfaces and even the ductless glands are nourished, energized and inhibited, regulated and dominated, each and severally, by distinct nerve centers or ganglia, which are more readily located than are those of the brain. The general aggregation of these centers, with their multitudinous connections and ramifications, has been designated as the sympathetic nervous system. Each ganglion has its symmetric network of communicating and distributing fibers. These coalesce to form plexuses, many of which have received distinctive names, as the solar, cardiac, hypogastric, etc. Quite complex in structure, these plexuses include fibers emanating and radiating from both the cerebral and spinal systems. They both receive and conduct the nervo-vital impulses which preside over and control all the vital functions, every form of constructive, nutritional and destructive metamorphosis—secretion, elimination and the circulation of the blood. One enthusiastic specialist, who has given particular attention to the study of the pelvis and its contents, discourses seriously and withal plausibly of the "Abdominal Brain."

Without going quite so far, but basing one's conception on generally accepted data,

the pathologist of the day is not compelled to tax his imagination or credulity to reach the inference that any measure, application or influence that can be utilized to increase or diminish the blood-supply and nutrition of an organ or tissue can be availed of to profoundly affect its physiologic as well as its pathologic status.

As a matter of fact the principal resources of so-called natural therapeutics—climatic environment, heat and cold, hydrotherapy, gymnastics, systematized exercise, movement-cure and massage—all these have been invoked to the same end. So, too, the appeal to drugs—tonics, nervines, sedatives, stimulants, hypnotics, analgesics, anæsthetics, alteratives, detergents and eliminatives—though often unconsciously and indirectly, has really been with a view to arousing, increasing, diminishing or inhibiting the functional activity of one or more of the various nerve ganglia or trophic centers. In no department of scientific research has modern investigation been more persistent or exhaustive, and in no direction has experimentation been more analytical or accurate.

Bearing all this in mind, the claim that the trophic centers of the human organism

can be directly and effectively influenced by deftly induced and properly applied mechanical vibratory stimulation, is both plausible and logical.

Modern habits of living, with social constraints and conventionalities that have been either self-imposed or difficult to escape, have combined to induce serious changes in the functional tonus if not in the anatomical integrity of the entire nervous system of the human animal. In this country in particular a neurotic dyscrasia has become so common that some pathologists are inclined to attribute it to inevitable transitional causes—a stage in the evolutionary history of the race.

In connection with the latest special study of the pathology of the nervous system it is claimed by Geyser that in case of disordered nerve-ganglia, or of diseased organs or areas supplied by the same, the temporary application of a labile, high-tension electrical current along the spine and over the site of the various ganglionic centers will be followed by a distinct and very perceptible hyperemia of those centers whose corresponding organs are affected, or which are themselves dormant or disordered. Centers or ganglia not thus associated or affected do not show this response. For purposes of

this special diagnostic symptom the ordinary faradic machine is of no avail, its current being of too low tension. It requires a high-frequency current, such as may be derived from a static machine or from a suitable coil supplied with an adequate interrupter, to afford satisfactory results. In the absence of a suitable current these areas may be detected by digital pressure, and will be found to be hyperesthetic if not distinctly painful to the touch. In utilizing the static current for diagnostic purposes it will add to its efficiency if the patient be insulated and one pole of the machine grounded, in which case a glass vacuum electrode having a rather broad surface should be used.

Having located the hypersensitive areas, it is not difficult for a reasonably expert anatomist to trace the involved organ or tissue.

Not content with the overrated temperature-and-test-meal method of diagnosis, if we push the investigation of functional disturbances and organic involvement we will frequently discover fundamental causes in the form of atrophied or contracted muscles, absorbed cartilages, and sometimes slight or serious but unsuspected distortions and displacement of articulations and osseus structures. These slight vertebral deviations—

the stock in trade of the disciples of Osteopathy — are actually present in a large number of cases in which they have escaped the notice of even expert diagnosticians, simply because the latter have not looked for them. They have resulted from muscular contractures, faulty habits as to bodily positions or attitudes, imperfect nutrition of the parts, impeded circulation caused by pressure from the clothing worn, and from local abscesses or disease. Other bones than those of the spinal column, especially the ribs, scapulæ and pelvic bones are quite subject to asymmetric deviations, which sometimes cause pressure upon nerve ganglia or their radiating branches, and thus seriously interfere with some one or more of the vital functions.

Since all nerve impulses unquestionably consist of vibrations, it logically and physiologically follows that a disordered nerve is one whose vibratory rhythm has been thrown into discord or interrupted. Admitting that trophic centers directly and constantly preside, each over its own particular organ or tissue, gland, viscus or bloodvessel, and that when it is compressed, injured or exhausted it causes the organ or tissue to flag in its functions, and also that,

reflexly, any injured, diseased or undernourished organ or tissue depresses or demoralizes the nerve center with which it is anatomically associated, it is an equally logical and physiological inference that any force, process, manipulation or influence that will correct the structural asymmetry, slight though it may be, and at the same time restore the impulse-rhythm of the involved nerve mechanism, will thereby prove itself a perfectly natural, legitimate and fairly ideal therapeutic measure.

To this end, as already noted, all the promising or possible resources of art and nature have been tentatively invoked—drugs, manual manipulation, exercise, the movement cure, gymnastics, galvanism and faradism, the violet ray and high frequency currents—all of which, together with various psychic influences, have been accredited with some degree of therapeutic virtue, but none of which is capable of affording in certain cases such radical and satisfactory results as mechanical vibratory stimulation. In this connection the word stimulation is used in its physiologic and not in its popular sense.

The principle itself is not strictly new, but the method of utilizing it has but recently

been made conveniently and efficiently available. A careful investigation of it, including the severest clinical tests, will convince the inquirer that it is at once ingenious, strictly legitimate and therapeutically comprehensive.

While physiologists do not yet claim to explain all the processes and metabolic changes that take place in nerve structures certain basic facts have been demonstrated, and in this connection it will be an instructive reminder to the practitioner who has not kept in constant touch with the later developments in physiology to cite from standard works on physiology, a condensed resumé of the known laws of nerve life, action and influence on which this practically new system of vibratory stimulation is based.

1. Physiologic or normal stimulus applied to nerves generates nerve-motion, which travels in either a centrifugal or efferent direction from the central system.

2. The results of this nerve-impulsion may be either motion, the inhibition of motion, or secretion.

3. When an impulse reaches the central organs it either excites sensation or perception, or is transferred to the motor areas, or is conducted in a centrifugal direction and

constitutes what is known as reflex stimulation.

4. Mechanical stimulation when applied with sufficient rapidity produces a change in the form of the nerve particles.

5. Stimulated sensory nerves respond with sensation, which may be increased to pain; stimulated motor nerves with muscular motion.

6. A light blow upon the radial nerve of the forearm or upon the axillary nerves causes the muscles supplied by these nerves to contract.

7. Mechanical stimulation of a nerve does not cause it to become acid as do other forms of stimulation.

8. If a mechanical stimulus be applied to a nerve very gradually it will render the nerve inexcitable without its manifesting any signs of being stimulated.

9. Pressure on a nerve if gradually increased in intensity first increases and then diminishes its excitability.

10. Pressure on a mixed nerve abolishes reflex conduction sooner than it does motor conduction.

11. Chemical stimuli applied to nerve structures first increase and then decrease or paralyze their excitability.

12. If by mechanical stimulation the axial

cylinder of a nerve be interrupted impulse-waves across the inhibited part are interrupted.

13. A nerve may be completely paralyzed by a violent shock.

14. Separating a nerve from its nutritive or trophic center destroys its excitability, and in warm-blooded animals it soon undergoes fatty degeneration.

15. If the sensory fibers of the root of a spinal nerve be divided at a point between the ganglion and the spinal cord its peripheral fibers do not denegerate, since the ganglion is their nutritive center. But the fiber-ends connected with the cord degenerate.

16. Anterior and posterior nerve-roots are controlled by different centers.

17. The regeneration of a nerve is always accomplished through its nutritive or trophic center, and as long as a nerve is connected with its trophic center and is not wholly destroyed it is capable of being regenerated.

18. When a nerve is either dead or permanently severed from its trophic center it can not be recovered.

19. Although the exact nature of trophic

influence is still largely a matter of study and speculation, the practical fact that the trophic centers control heat production and accomplish the nutrition of all the various organs and tissues, chiefly if not wholly by controlling the blood-supply of the parts, has been satisfactorily established.

20. If a nerve-center or conducting nerve-fiber becomes deranged or lags in its function the organ or part with which it is connected soon degenerates, and this degeneration constitutes disease.

21. Regardless of the distinctive names that may be applied to them, all forms of tissue-degeneration are essentially and necessarily of nervous origin.

22. It is found that the mechanical work executed by an excited muscle as the result of mechanical stimulation *is one hundred times greater* than the energy expended by the mechanical stimulant.

It is easy to recognize the bearing of these undisputed and authoritatively established facts in neurology, and it is impossible to deny that they provide a broad basis on which to erect a therapeutic system with vibratory stimulation as its rational foundation.